

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
10 January 2002 (10.01.2002)

PCT

(10) International Publication Number  
WO 02/02735 A1

(51) International Patent Classification<sup>7</sup>: C12M 1/00 (74) Agents: LEE, Sun, Haeng et al.; Fl. 305 Newseoul Building, 828-8 Yeoksam-dong, Kangnam-gu, Seoul 135-080 (KR).

(21) International Application Number: PCT/KR01/00659 (81) Designated States (national): AU, CA, CN, JP, RU, US.

(22) International Filing Date: 20 April 2001 (20.04.2001) (84) Designated States (regional): European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR).

(25) Filing Language: Korean

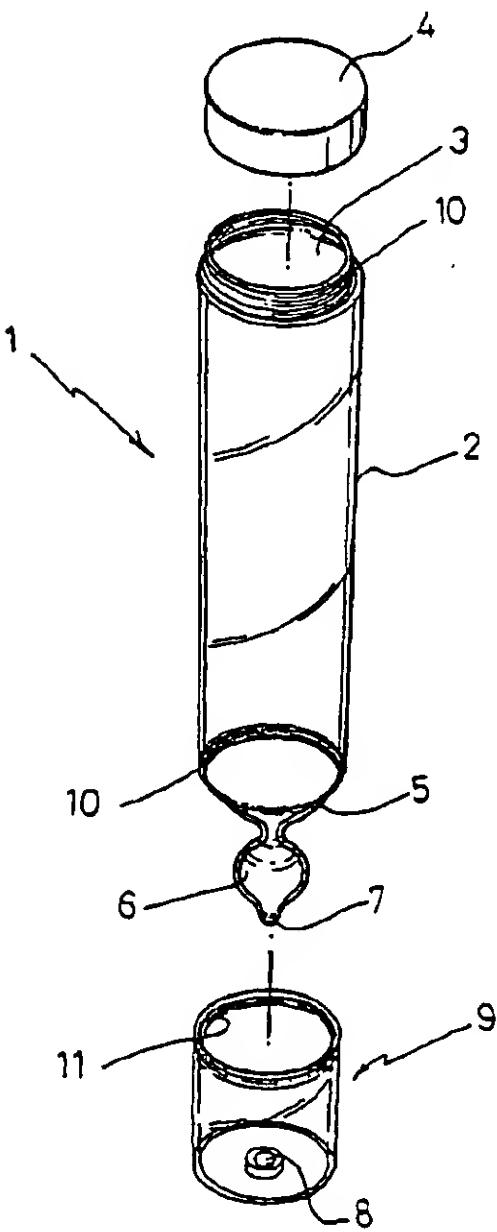
(26) Publication Language: English

(30) Priority Data:  
2000/34212 21 June 2000 (21.06.2000) KR Published:  
— with international search report

(71) Applicant and  
(72) Inventor: LEE, Soon, Wook [KR/KR]; B-401, Hansung Apt. 47, Yeouido-dong, Yeongdeungpo-gu, Seoul 150-010 (KR).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: TOP AND BOTTOM OPEN CENTRIFUGE TUBE



(57) Abstract: The present invention relates to a top-bottom opening and closing type centrifugal separation tube for accelerating the separation process of multitude of cells and bacteria and improving the accuracy of examination and also at the same time allows the simple separation between liquid and foreign substances possible. The present invention comprises a conventional lid fixed by a screw on the upper end of a transparent synthetic resin tube, a single body ring-tube shaped collection tube in a gourd shape on the lower end of the transparent synthetic resin tube and a bolt and a nut section at the tapered section on the upper section of the ring-shaped collection tube. The bolt section is united with a support cap and a watertight cap is formed at the center section of the support cap in order to seal the entry of the ring-type collection tube. The present invention allows a convenient and accurate examination within shorter examination time possible by being able to separate the cells without discarding the liquid at the time of cell separation. This is achieved by uniting with the support cap at the lower section of the transparent tube and inserting the liquid or inserting the collected cells to the liquid with the lid at the upper section open and allowing the cells accumulate within the ring-shaped collection tube through downward precipitation when centrifugal separation is performed.

WO 02/02735 A1

## TOP AND BOTTOM OPEN CENTRIFUGE TUBE

## BACKGROUND OF THE INVENTION

5        The present invention relates to a top and bottom open centrifuge tube for accelerating the separation process of a multitude of cells and bacteria and improving the accuracy of examination and also at the same time allows the simple separation between liquid and foreign substances possible within the premises of examination center or research center. More specifically, the present invention relates to a top and  
10      bottom open centrifuge tube for separating a multitude of cells and bacteria during the bacteria cultivation of cerebrospinal fluid, ascitic fluid and pleural fluid, or cancer examination, or bacteria cultivation examination using various types of cotton sticks especially when rotating the centrifugal separation tube in order to precipitate the cells and bacteria at the bottom of the tube and collecting them in a ring-shaped collection  
15      tube after dipping a cotton stick into the centrifugal separation tube where a transporting cultivation paper is located and then coating on a slide or cultivating the bacteria.

## SUMMARY OF THE INVENTION

20      The conventional method of examining bacteria usually involves collecting examining bodies (cells, bacteria) using a cotton stick from the patient's affected part and inserting the cotton stick into a test tube where a transporting cultivation paper is located and transporting the test tube to an examination room. However, in this case, an accurate examination work becomes very difficult when stained to jell type cultivation  
25      paper or the examination body is left behind in the test tube. Also, in order to examine cerebrospinal fluid, ascitic fluid and pleural fluid to test the existence of cancer cells or leukemia, the remaining liquid after a centrifugal separation was discarded to leave only

the precipitates for collecting the cells and the precipitates were then coated on the slide. This process was time consuming and some of the cells were lost in the process. Presently, the examination body container used in each of the hospital, pharmaceutical company, food research center and quarantine center has a lid on the top and the bottom 5 part is sealed. As a result, some serious difficulties arise due to the problems as mentioned above during the cell separation.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10 FIG. 1 is a disassembled view of centrifugal cell separation transparent tube according to the present invention.

FIG. 2 is a cross section of assembled centrifugal cell separation transparent tube according to the present invention.

15 FIG. 3 shows the pumping tube section on the lid at the upper end of disassembled view of centrifugal cell separation transparent tube according to another embodiment of the present invention.

FIG. 4 is a disassembled view of centrifugal cell separation transparent tube according to further embodiment of the present invention.

20 FIG. 5 shows the cross section of a practical example of centrifugal cell separation transparent tube in FIG. 4.

FIG. 6 shows the pumping tube section on the lid at the upper end of disassembled view of centrifugal cell separation transparent tube according to another embodiment of FIG. 4.

(Description of the numeric on the main parts of the drawings)

25 1, 1': Transparent Tube

2: Body

3: Opening Section

4, 4': Lid

5, 5': Tapered Section

6: Ring-Shape Collection Tube

7: Entry

5 7': Withdrawal Tube

8: WaterTight Cap

9, 9': Transparent Support Cap

10: Bolt Section

11: Nut Section

10 12: Liquid

13: Cells or Bacteria within the Examination Body

#### DETAILED DESCRIPTION OF THE EMBODIMENTS

15

The present invention is designed to overcome the above problems of prior arts. The present invention comprises a conventional lid fixed by a screw on the upper end of a transparent synthetic resin tube, a single body ring-shaped collection tube in a gourd shape on the lower end of the transparent synthetic resin tube and a bolt and a nut section at the tapered section on the upper section of the ring-shaped collection tube.

The bolt section is united with a support cap and a watertight cap is formed at the center section of the support cap in order to seal the entry of the ring-type collection tube.

The present invention allows a convenient and accurate examination within shorter examination time possible by being able to separate the cells without discarding the liquid at the time of cell separation. This is achieved by uniting with the support cap at the lower section of the transparent tube and inserting the liquid or inserting the

collected cells to the liquid while the lid at the upper section open and allowing the cells accumulate within the ring-shaped collection tube through downward precipitation when the centrifugal separation is performed.

Hereinafter, preferred embodiments of the present invention will be described in 5 detail with reference to the accompanying drawings.

A tube with an opening/closing lid at the upper end of opening section comprising: a 10 tapered section 5 in a funnel shape at the lower end of a synthetic resin body 2; a transparent tube 1 which forms a single body with a ring-shape collection tube in a gourd shape with an entry at the lower section; a transparent support cap 9, where a bolt section is formed at the connection between the lower end of said transparent tube 1 and the tapered section; a ring-shape collection tube 6 which forms a single body with a 15 water-tight cap 8 that is located at the center of the transparent support cap 9 which in itself unites with the lower end of said transparent tube 1 and is designed to seal the entry 7 by unifying with the transparent tube 1; wherein the cells precipitate in the ring-shape collection tube 6 if the cells 13 or the bodily fluid on which the cells are floating are inserted to the liquid 12 in said transparent tube 1 and the cells can be separated by contracting the body of synthetic resin transparent tube 1 during the cell separation.

According to another embodiment of the present invention, the upper section of the lid that unites with the upper end opening section of said transparent tube 1 is formed in 20 a concave tube shape in order to be able to pump out during the cell separation.

According to a further embodiment of the present invention, in order to be able to separate the cells a funnel shape tapered section 5' and a withdrawal tube 7' at the lower section of the transparent tube 1' that has a concave shaped lid 4' at the upper section or a conventional lid 4 at the upper end of the opening section 3 and a transparent support 25 cap 9' that has a water-tight cap 8 by forming a bolt at the connection between the lower end of the transparent tube 1' and the tapered section.

According to the present invention, the collected cells 13 from the patient's affected

part are inserted to the liquid 12 contained in the transparent tube through the opening section at the upper end after sealing the entry 7 of the ring-shape collection tube 6 at the lower end by uniting with the transparent support cap at the lower end of the transparent tube 1.

5 As mentioned above, after inserting the cells or the bodily fluid on which the cells are floating are inserted to the liquid 12 and when the transparent tube is rotated using a centrifugal separator after closing the lid 4 at the opening section 3, the cells in the liquid are precipitated downward and collected in the ring-shaped collection tube 6 consequently forming a accumulation as shown in FIG. 2.

10 The cells 13 (examining body) collected in the ring-shaped collection tube 6 when coated on a slide cultivation paper, only the cells can be separated and withdrawn if the body 12 of the synthetic resin transparent tube 1 is pressed slightly after opening the transparent support cap 9.

15 At this instance, even if the transparent support cap 9 is opened, the liquid or the cells do not flow out since the lid 4 at the upper end is closed.

As mentioned above, during the separation of the cells in the ring-shaped collection tube 6 towards the entry 7 by pressing the body 2 of the transparent tube 1, the liquid is not completely sealed but small amount of the liquid flows out. However, a much greater amount of the cells pass through the entry 7 than the liquid.

20 According to another embodiment of the present invention, the lid that unites with the upper end opening section of said transparent tube 1 is formed in flexible synthetic resin or a tube in rubber material in order to be in a concave tube shape as shown in FIG. 3. Hence, during the separation of the cells accumulated in the ring-shaped collection tube 6, the concave tube part at the upper end of the lid 4' can be pumped in order to separate 25 the cells instead of pressing the body 2 for pumping purpose.

According to still another embodiment of the present invention, as shown in FIG. 4 and FIG. 5, a funnel shape tapered section 5' and a withdrawal tube 7' at the lower

section of the transparent tube 1' that has a concave shaped lid 4' at the upper section or a conventional lid 4 at the upper end of the opening section 3 in FIG. 6 in order to make the cells to accumulate in the tapered section 5' and withdrawal tube 7'. A bolt section is formed at the connection between the lower end of the transparent tube 1' and the 5 tapered section 5', in order to seal the watertight cap 8 and withdrawal tube 7' when united with the transparent support cap.

Likewise, the transparent tube 1' in FIG. 4 when the examining body is inserted to the liquid, the cells accumulate in the withdrawal tube 7' at the lower end of the funnel shaped tapered section therefore the cells accumulated in the withdrawal tube 7' can be 10 withdrawn by pumping the lid 4' that has a concave tube at the upper end or at the body of the transparent tube 1'.

The present invention is convenient and simple for separating cells, bacteria and liquid but its use is not only limited for examining cancer cells. It can also be used for separating between testing sample and testing medicine using a centrifugal separator in 15 a quarantine office for examining the farming products and livestock.

Also, if the present invention is to be used by students in science laboratory, the test tube and sampling tube are not necessary instead the present invention can perform these two functions.

## WHAT IS CLAIMED IS:

1. A top and bottom open centrifuge tube comprising:  
a tapered section 5 in a funnel shape at the lower end of a synthetic resin body 2;  
a transparent tube 1 which forms a single body with a ring-shape collection tube in a  
5 gourd shape with an entry at the lower section;  
a transparent support cap 9, where a bolt section is formed at the connection between  
the lower end of said transparent tube 1 and the tapered section; and  
a ring-shape collection tube 6 which forms a single body with a water-tight cap 8 that is  
located at the center of the transparent support cap 9 which in itself unites with the  
10 lower end of said transparent tube 1 and is designed to seal the entry 7 by unifying with  
the transparent tube 1;  
wherein the cells precipitate in the ring-shape collection tube 6 if the cells 13 or the  
bodily fluid on which the cells are floating are inserted to the liquid 12 in said  
transparent tube 1 and the cells can be separated by contracting the body of synthetic  
15 resin transparent tube 1 during the cell separation.
2. The tube as claimed in claim 1, wherein the upper section of the lid that unites with  
the upper end opening section of said transparent tube 1 is formed in a concave tube  
shape in order to be able to pump out during the cell separation.

20

3. The tube as claimed in claim 1, wherein said upper end of the opening section  
unites with a conventional lid 4 and a funnel shape tapered section 5' and a withdrawal  
tube 7' at the lower section of the transparent tube 1' are formed in order to make the  
cells inside to accumulate in the withdrawal tube 7' and a bolt section is formed at the  
25 connection between the lower end of the transparent tube 1' and the tapered section 5',  
in order to unite with the transparent support cap 9' that has a water-tight cap 8

1/6

Fig. 1

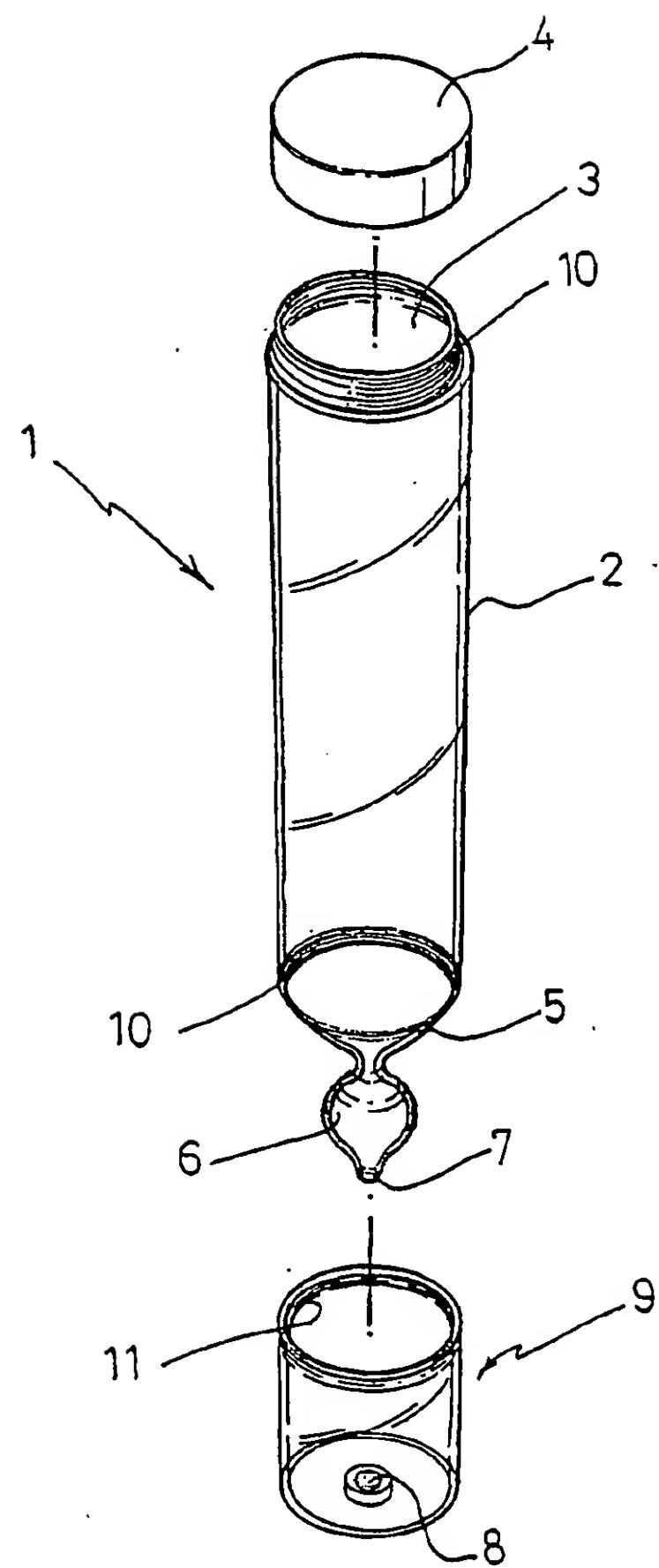
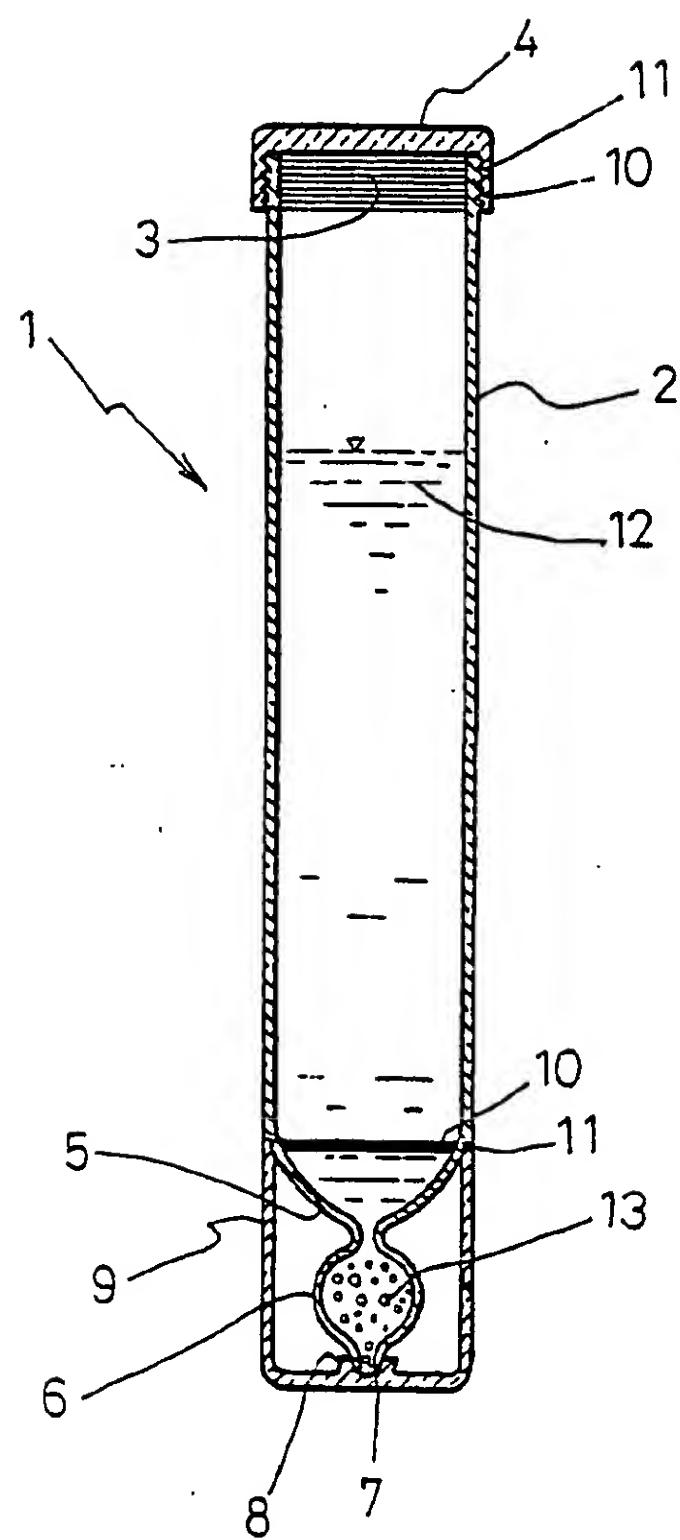


Fig. 2



3/6

Fig.3

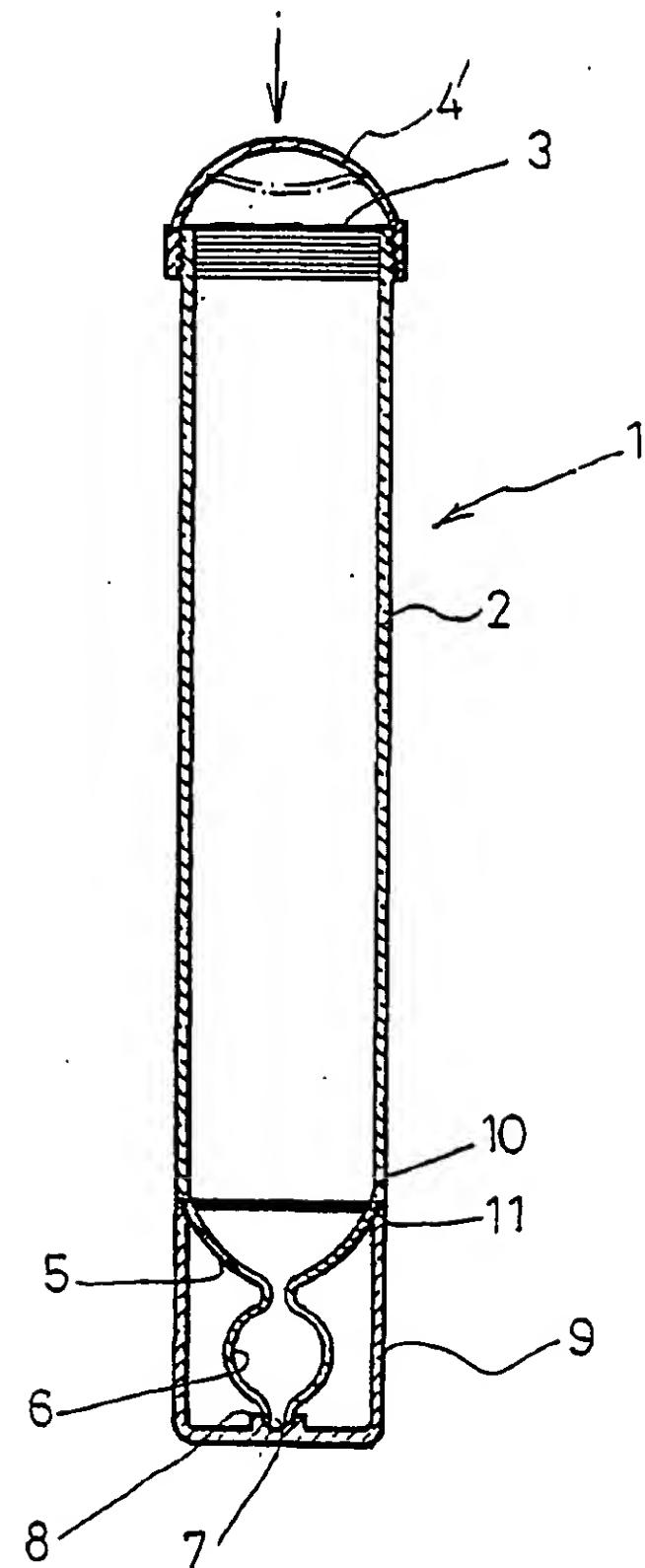


Fig. 4

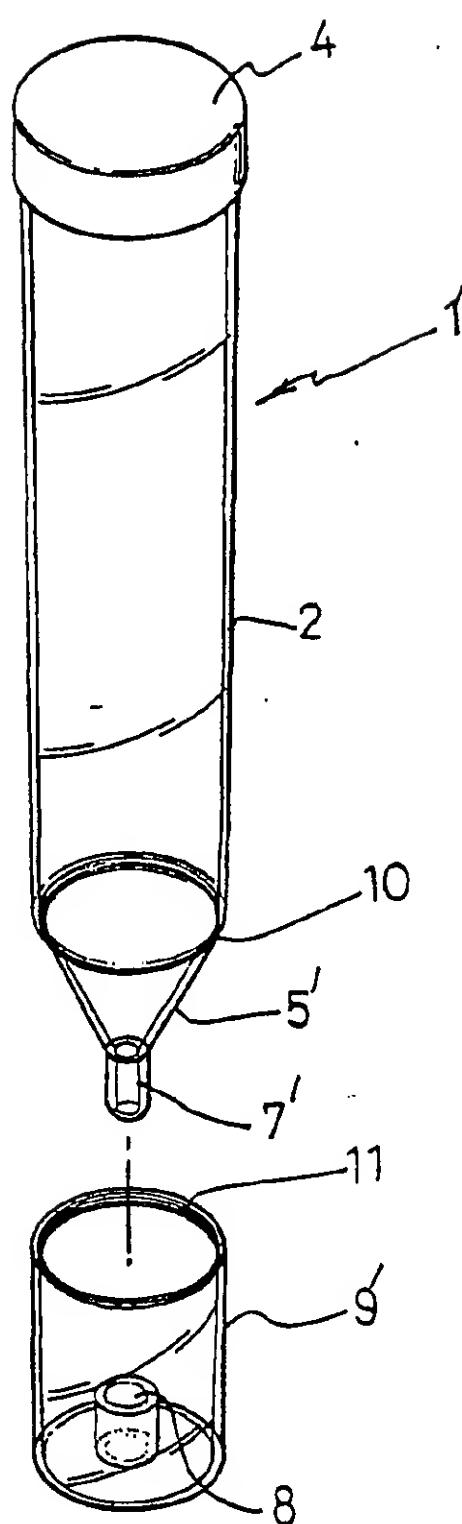
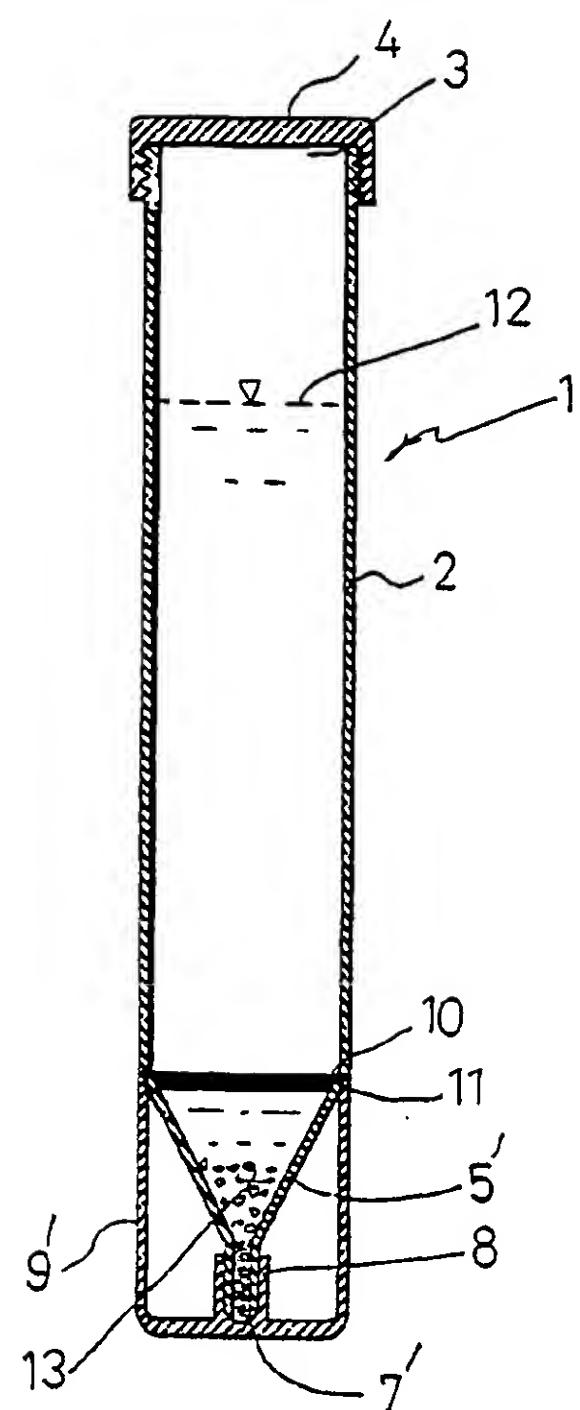
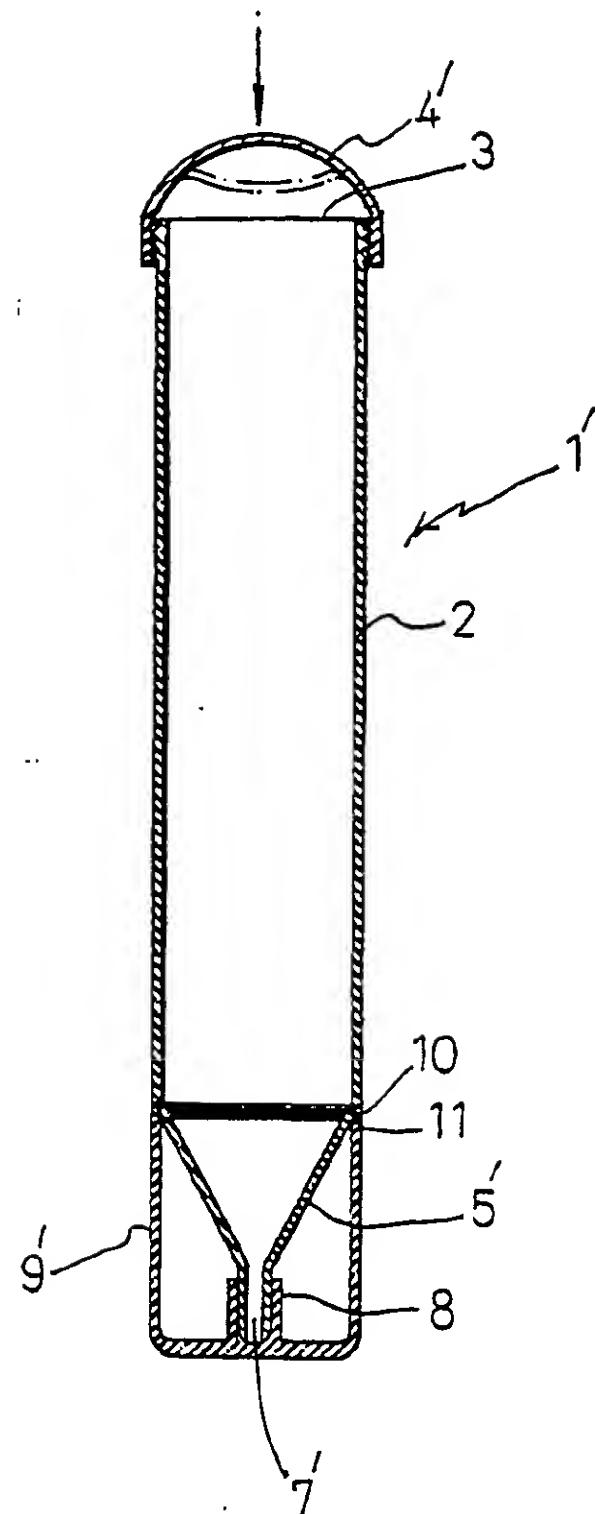


Fig. 5



6/6

Fig. 6



## INTERNATIONAL SEARCH REPORT

International application No. PCT/KR01/00659
---

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7 C12M 1/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7 C12M 1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  
Korean Patents and applications for inventions since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PAJ, EspaceNet, IPDL(WIPO), USPTO, NPS(KIPO)

"centrifug\*" and (tube or device) and bolt and nut", "centrifug\*" and tube and bottom and (open\* or cap or closure)\*

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 11-64183 A (CHO BOKEI) 5 March 1999	1 - 3
A	KR 88-4313 A (JUN DONG MYUNG) 7 June 1988	1 - 3
A	US 5996811 A (FUJI PHOTO FILM CO LTD) 7 DECEMBER 1999	1 - 3
A	US 4364903 A (BECTON, DICKINSON AND COMPANY) 21 DECEMBER 1982	1 - 3

 Further documents are listed in the continuation of Box C. See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search  
22 AUGUST 2001 (22.08.2001)Date of mailing of the international search report  
23 AUGUST 2001 (23.08.2001)Name and mailing address of the ISA/KR  
Korean Intellectual Property Office  
Government Complex-Daejeon, Dunsan-dong, Seo-gu, Daejeon  
Metropolitan City 302-701, Republic of Korea  
Facsimile No. 82-42-472-7140Authorized officer  
HAN, Hyun Sook  
Telephone No. 82-42-481-5596

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

PCT/KR01/00659

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5996811 A	07-12-99	JP 10-225448 A	25-08-98